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ABSTRACT

The relationship of educational preparation to the problem-solving performance of 55 hospital employed baccalaureate and associate degree nurses working in Wyoming hospitals was studied. Participant data were collected that might correlate with problem-solving ability: age, years of experience in nursing, years of work experience in a health-related field before becoming a nurse, total years of higher education, and areas of work (general medical-surgical nursing and intensive care/emergency room nursing). A Patient Management Problem developed by Holzemer was the problem-solving instrument. Using hierarchical multiple regression analyses, no significant differences were found in baccalaureate and associate level nurses' performance on a proficiency scale. The baccalaureate nurses were more efficient and selected fewer negatively weighted items. Educational preparation explained about 8% of the variance in performance on the efficiency scale. The variable, years of education, made a significant contribution to performance on the proficiency scale. (SW)

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PROBLEM SOLVING IN NURSING

by

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Abstract

Problem Solving in Nursing

The relationship of educational preparation to the problem solving performance of 55 baccalaureate and associate degree prepared nurses working in selected Wyoming hospitals is investigated. A latent image branching simulation of a patient management problem developed by Holzemer, et al, was the research tool used.

Hierarchical multiple regression analyses were used to test two null hypotheses concerning differences in subjects on the proficiency and efficiency scales. Selected covariates (age, years of health related work experience prior to nursing, years of nursing, years of higher education, and area of hospital work) were entered into the equation prior to educational preparation in order to control for their relationship with the dependent variables.

There was no significant difference between baccalaureate and associate degree nurses on the proficiency scale. There were significant differences ($p < .10$) on the efficiency scale. The baccalaureate nurses were more efficient and selected fewer negatively weighted items. The magnitude of effect indicated that educational preparation could explain about 8 percent of the variance in performance on the efficiency scale. The variable, years of education, was found to make a significant contribution to performance on the proficiency scale.

PROBLEM SOLVING IN NURSING

It is increasingly impossible to provide adequate coverage of all specific topics in crowded nursing programs. It is, therefore, imperative that the object of professional nursing education be to develop efficient problem solvers in the discipline. An efficient problem solver is one who is able to "transfer" or apply prior knowledge and skills to a new or novel situation, one for which there is no readily apparent solution. While the literature evidencing transferability of knowledge and skills to new problem solving situations is mixed, researchers in problem solving do advocate the teaching of "powerful general methods" (heuristics) which will aid in this transfer of training (Davis, 1973; Simon, 1978).

In Nursing, study of the problem solving abilities of nurse graduates is reflected in the literature beginning in 1968. There has been considerable speculation that the type of educational program (professional or technical) can affect problem solving abilities (deTornyay, 1968; Verhonik, 1968). Although the issue of entry level into professional nursing has been generally resolved and is gradually being implemented across the United States, the effect of education on ability to problem solve remains a debatable issue. The question is not only whether or not education affects problem solving ability by graduation, but whether it has an effect over time on the problem solving abilities of the working nurse. The primary purpose of this study was to investigate the relationship of educational

preparation to the problem solving performance of hospital employed baccalaureate and associate degree prepared nurses.

Review of Literature

Three general factors have been correlated with problem solving skills. The first is that of education or breadth of knowledge; the second includes the personal characteristics and cognitive processing skills of the individual and the third is the nature of the problem (a novel situation must be presented in order for an individual to use problem solving skills to the greatest extent) (Davis, 1973; Mayer, 1983).

Ideally, the focus, emphases and expectations (goals) of an educational program should influence development of problem solving skills. A baccalaureate (professional) nursing program is expected to develop practitioners who base their practice on theory and empirical data and know the "why" of what they do. They are to identify the entire range of client problems, concrete to abstract, and approach care using both standard accepted courses of action as well as modified innovative actions (DeYoung, 1981; Rogers, 1985). The goals of the associate degree (technical) nursing program are to prepare a practitioner who is to identify common, recurring, concrete specific client problems and to implement previously accepted courses of action which have predictable outcomes (McClure, 1978). Both programs teach that the nursing process is the primary problem solving tool. A comparison of problem solving abilities of associate degree and baccalaureate prepared nurses provides an excellent method to analyze these assumptions.

There have been numerous studies (Goldstein, 1980; Gray, Murray, Roy, and Sawyer, 1977; Hogstel, 1977; Howell, 1978; Murray and Morris, 1982; Waters, Chater, Vivier, Urrea, and Wilson, 1972) documenting differences in personal characteristics, role performance and role perception of nurses according to educational preparation. However, empirical studies dealing with problem solving in nursing have not consistently indicated that there is a correlation between educational preparation and problem solving ability. Of four studies conducted comparing problem solving skills of associate degree and baccalaureate senior students or new graduates, two, those by Frederickson and Mayer (1977) and by Gover (cited in Sparks, 1979) drew the conclusion that there were no differences between groups in the application of problem solving skills to nursing. Both of these studies used scenarios which depicted situations commonly encountered by nurses in hospitals, and thus raised questions of construct validity if use of problem solving skills requires the presence of a novel situation.

Sparks (1979), in the third study, found no differences between professionally or technically educated registered nurse graduates on the Nursing Process Simulation Inventory (NPSI). She did, however, detect significant differences on an instrument which she developed which allowed respondents to generate answers rather than merely to respond to given alternatives as were provided in all the other instances.

Reid (1981), in comparing groups of associate degree and baccalaureate new graduates, examined two instruments which had

been used to study problem solving in nursing students, the NPSI and the Clinical Nursing Simulation Instrument (CNSI). She concluded that the conflicts apparent in the studies may be attributable, in part, to the psychometric properties of the tests and called construct validity and reliability into question.

Problem solving skills between other groups of nurses has been studied with more conclusive results. Holzemer, Schleutermann, Farrand, and Miller et al. (1981) and Farrand, Holzemer, and Schleutermann (1982), in establishing construct validity for problem solving for three Patient Management Problems (PMPs), found that nurse practitioners scored higher than other nurses (AD, BSN, and Diploma prepared) in their sample. Although the statistical significance was not reported, and the sample was very small ($n=12$), they found the baccalaureate prepared nurses did better than the associate degree/diploma nurses on all three PMPs.

An empirical study by Guyton (1984) indicates the difficulty in trying to improve problem solving skills by direct teaching of problem solving methods. Guyton implemented a three week course designed to aid participants in the development of cognitive strategies (heuristics) and of consciousness of their own thinking processes. She found no differences in scores on a problem solving instrument between control and experimental groups. It is evident that nursing must continue to study both the development and evaluation of problem solving.

Method

A convenience sample consisting of volunteer associate

degree and baccalaureate prepared nurses who were practicing in Wyoming hospitals of moderate size (between 90 and 350 beds) was identified. All nurses who were working in areas which allowed for some general med-surg practice were invited to participate in the study. A total of 108 (53 BS; 55 AD) consented to participate and were sent the problem solving tool by mail. A total of 63 instruments were returned to the investigator; 55 (24 AD; 31 BS) had been filled out correctly and were included in the study.

Demographic data collected on the participants included information on variables which have been shown to be correlated with problem solving ability and were included in the study as covariates. They included age, which has been shown to correlate positively with general problem solving skill. The next three covariates are years of experience in nursing, years of work experience in a health related field prior to becoming an RN, and total years of higher education. These variables would contribute to breadth and depth of knowledge, both clinical and general, and thus contribute to an individual's ability to problem solve.

The last covariate, area of work, was divided into two sections, general medical-surgical nursing, and intensive care/emergency room nursing. One of the concerns nursing leaders have voiced is that many hospitals do not provide opportunity for professional nurses to practice professionally (Howell, 1978). If nurses have not been encouraged to practice professionally, they may not have maintained or further developed their problem solving skills in the work setting. It was thought that

practicing in an ICU or ER may require nurses to utilize their problem solving skills more intensively and, therefore, that nurses working in these areas would perform better on the problem solving instrument.

Characteristics of baccalaureate and associate degree nurses were comparable to those of associate degree and baccalaureate degree nursing students who have taken part in other studies (Sparks, 1979). Table I shows the comparisons on the covariate variables between groups.

A Patient Management Problem (PMP) developed by Holzemer et al. (1981) was the problem solving instrument used in this study. The PMP is a 37 page, 297 item, paper and pencil, latent image format, branched simulation which presents the subject with a patient encounter representative of the clinical practice of an adult or family nurse practitioner. The situation includes two medical problems, an acute respiratory illness (presenting complaint) superimposed over chronic respiratory disease. The subject is to gather data considered essential and to select from a series of decisions those desired, as well as those which are considered to be essential to safe and quality care.

The instrument was chosen because it presented a novel situation, one which most nurses would not have encountered in hospitals in Wyoming, yet drew on an area of knowledge comparable between the two groups. In addition, it was the only published problem solving nursing tool which had been shown to have evidence of construct validity and it could be objectively scored. Construct validity of the PMP as a measure of problem

TABLE I
DESCRIPTIVE SUMMARY STATISTICS FOR COVARIATE
VARIABLES BY PROGRAM

Characteristic	Sample	<u>N</u>	<u>$\bar{x}$</u>	<u>SD</u>
Age	BSN	31	30.9	6.47
	ADN	23	33.9	8.50
	Total	54	32.18	7.48
Years of prior health-related work experience	BSN	31	1.58	2.14
	ADN	24	3.25	1.73
	Total	55	2.31	3.07
Years in Nursing	BSN	31	5.87	3.93
	ADN	24	6.04	6.40
	Total	55	5.95	5.10
Years of Higher Education	BSN	31	4.70	1.14
	ADN	24	3.62	1.73
	Total	55	4.22	1.53
% Working in ICU/ER	BSN	31	.33	.48
	ADN	24	.27	.45
	Total	55	.30	.46

solving skill has been supported by two studies. In the first study Holzemer et al. (1981) used a multitrait, multimethod approach in which the correlation of multiple measures of nurse practitioners' behaviors in different situations gave support for the construct validity of the instrument. The second study (Farrand et al., 1982) included a national sample of nurses and nurse practitioners and three PMPs. Meaningful differences between groups again supported the claim for the construct validity of the simulations.

Scoring of the PMP required the establishment of specific item by item criteria by the investigators in order to assign weights to the items. Essential items received a +1; contributory but nonessential items received a 0; inappropriate, unsafe, or excessively costly items received a -1 weighting. Two scores were obtained: the proficiency score, which is composed of the points earned by the subject divided by the sum of the maximal points to be earned and multiplied by 100 to convert to a percentage; and the efficiency score, which is composed of the number of positive items chosen by the subject divided by the total number of items chosen. The efficiency score when evaluated in conjunction with the proficiency score indicates how carefully a subject evaluated choices.

Data Analysis

Testing of the major hypotheses of the study (there are no differences between AD and BS prepared nurses on proficiency or efficiency scores) was done through use of multiple regression analysis. Each of the dependent variables was regressed across

the set of independent variables in a hierarchical fashion, with the predictors (covariates) first and the variable educational preparation entered second. The advantage of this process is that it forced the entry of all other independent variables under consideration before allowing entry of the main independent variable. Thus the contribution of all other independent variables which could confound the effect of the primary variable under consideration is considered as a set of covariates and the unique contribution of the independent variable of primary interest is readily apparent. Because of the small sample size, the level of significance was set at .10. Computation of the magnitude of effect of the independent variable on the outcomes was done. This equation resulted in the squared multiple partial correlation coefficient, a measure of the percent of variance in the dependent variable from which the covariates were partialled accounted for by preparation from which the covariates were also partialled.

Findings

The means, modes, standard deviations and ranges of raw proficiency and efficiency scores of associate degree and baccalaureate nurses is shown in Table II. The mean score of the total group was 38.981 with a standard deviation of 12.063 on the proficiency scale, while the mean score of the total group was 59.927 with a standard deviation of 8.946 on the efficiency scale.

The results of the hierarchical regression analysis of the proficiency scale is shown in Table III. The change in Multiple

TABLE II
BREAKDOWN OF PROFICIENCY AND EFFICIENCY SCORES
BY PREPARATION

	Preparation	<u>N</u>	<u>$\bar{Y}$</u>	Mode	<u>SD</u>	Range
PROFICIENCY	ADN	24	38.417	45	13.862	-1 to 59
	BSN	31	39.258	47	10.689	9 to 51
	TOTAL	55	38.891	47	12.063	-1 to 59
EFFICIENCY	ADN	24	57.333	61	7.087	40 to 67
	BSN	31	61.935	66	9.798	45 to 83
	TOTAL	55	59.927	54	8.946	40 to 83

TABLE III
HIERARCHICAL REGRESSION OF TOTAL PROFICIENCY SCALE
ON INDEPENDENT VARIABLES

Variable	<u>F</u> to Enter	<u>p</u>	Multiple <u>R</u>	<u>R</u> ²	<u>R</u> ² Change	Overall <u>p</u>
Age	.16744	.684	.00197	.00000	.00000	.191
Areawork	2.73735	.104	.24635	.06069	.06069	
Years Ed	3.81100	.057	.36271	.13156	.07087	
Years Work	.06829	.795	.36702	.13470	.00315	
Years Nursing	.11890	.732	.36986	.13680	.00209	.283
Preparation	.07274	.789	.37162	.13810	.00131	

R^2 indicates the proportion of additional variance which would be explained by each successive variable in predicting performance on the scale. The value of the F statistic for the effect of preparation on proficiency scores was .073 which was not significant at the $p=.10$ level, indicating no difference in problem solving performance as measured by the PMP proficiency scale. The magnitude of effect (the squared multiple partial correlation coefficient) indicated that educational preparation could explain only .15 percent of the variance in performance on the proficiency scale after the covariates were partialled from both proficiency and preparation (see Table IV).

The results of the hierarchical regression procedure on the efficiency scale are reported in Table V. The overall R^2 Change was .06808 which was statistically significant ($.05 < p < .10$). The differences found on the efficiency scale indicate that the baccalaureate prepared nurses were more efficient in selecting options than were the associate degree prepared nurses. The magnitude of effect indicated that educational preparation could explain approximately 8 percent of the variance in performance on the efficiency scale with the covariates partialled from both efficiency and preparation (see Table IV).

The total number of negatively weighted options picked by each subject was also tabulated. The mean number picked by the associate degree nurses was 24.3 with a range of 10 to 44. The mean number picked by baccalaureate nurses was 19.1 with a range of 5 to 53. The difference between groups was significant at the $p < .05$ level, with the magnitude of effect indicating that

TABLE IV
SIGNIFICANCE AND MAGNITUDE OF EFFECT OF PREPARATION
ON PROFICIENCY AND EFFICIENCY SCALES

Dependent Variable	$R^2_{\bar{Y}.(B.A)}$	F	p	$R^2_{\bar{Y}B.A}$	$\bar{Y}_{AD}$	$\bar{Y}_{BS}$
Proficiency	.13810	.073	($p > .10$)	.0015	38.549	39.468
Efficiency	.19118	4.040	($.05 < p < .10$)	.0776	57.054	61.997

TABLE V
HIERARCHICAL REGRESSION OF TOTAL EFFICIENCY SCALE
ON INDEPENDENT VARIABLES

Variable	<u>F</u> to Enter	<u>p</u>	Multiple <u>R</u>	<u>R</u> ²	<u>R</u> ² Change	Overall <u>p</u>
Age	.29206	.591	.16162	.02612	.02612	.250
Areawork	1.88024	.177	.24175	.05844	.03232	
Years Ed	1.77105	.189	.30569	.09345	.03500	
Years Work	.05911	.802	.31980	.10227	.00882	
Years Nursing	1.16387	.286	.35085	.12310	.02083	
Preparation	4.04048	.050	.43724	.19118	.06808	.102

educational preparation could explain approximately 8 percent of the variance in performance.

Because the level of significance of the variable years of education suggested that it might make a significant contribution to proficiency (see Table II), hierarchical regression was also performed on this variable. It was indeed found to make a significant contribution ($p < .10$) to the proficiency scale when the effects of the other covariates and preparation were removed from proficiency.

Because the hierarchical multiple regression analysis was a parallel of an analysis of covariance, tests of the homogeneity of regression assumption were done. F statistics were calculated in the same manner as for the main hypotheses. The value of the F statistic for each scale is as follows: proficiency scale: $F(5, 43) = 2.256$, $(.10 > p > .05)$; and efficiency scale: $F(5, 43) = 1.025$, $p > .10$. The results for the proficiency scale should be interpreted with caution.

Discussion

On the basis of the findings of the study, several conclusions have been reached. In an overall sense, baccalaureate prepared nurses did perform better on the problem solving tool than did associate degree prepared nurses. The lack of differences between groups on the proficiency scale must be considered in conjunction with the presence of differences in performance on the efficiency scale (a function of the total number of negatively weighted item selected) as both are indicators of problem solving performance on the same instrument.

These differences indicate that the baccalaureate prepared nurses were more discriminant in their selection of items. This function could reduce their proficiency scores, because an appropriate item may not have been considered absolutely essential and therefore would not have been selected. The associate degree nurses had lower efficiency scores, indicating that they picked more items altogether to arrive at a proficiency score comparable to that of the baccalaureate nurses. This finding (a result of picking more negatively weighted items) indicates that the associate degree nurses were in more instances searching for information without knowing the relevance of the item to the situation.

While the combination of differences described above indicates that the baccalaureate nurses' group performance in problem solving was better than that of the associate degree nurses, the magnitude of effect was small enough to question the clinical significance of the findings. The approximately eight percent of problem solving performance which can be attributed to educational preparation would be impossible to translate into clinical performance. The small significance, however, may be attributed in part to the small sample size and the voluntary characteristic of the sample.

These findings cannot be generalized beyond the sample. It is possible that those nurses who participated did so because they have more confidence in their abilities to problem solve than those who decided not to participate. The difference in return between baccalaureate nurses (64%) and associate degree nurses (53%) may also indicate that baccalaureate prepared nurses

felt somewhat more comfortable in completing the instrument than did the associate degree nurses.

Total years of education was the only covariate shown to be an important factor in problem solving performance. There is an increasing interest in considering alternative methods of educating professional nurses. Two methods are being used at present; both accept students with a baccalaureate in another field and offer advanced degrees. One offers a masters in nursing with a clinical specialty focus; the other offers a nursing doctorate (ND), and prepares a generalist in nursing. The findings of this study lend some support to the recognition that a degree in another field has validity as a background for the profession of nursing.

Clearly, further study in the effect of education on development of problem solving needs to be conducted. Nursing needs the development of problem solving tools which can be easily administered and objectively scored. Longitudinal studies in problem solving will be of particular help to nurse educators and will impact curriculum development and teaching methodologies. Further research is needed to delineate specific heuristic techniques (in addition to the use of the Nursing Process) which may lead to an increased ability to problem solve. Delineating problem solving differences in nurses which can be attributed to educational programs remains a viable issue as a differentiation in utilization of these graduates is mandated.

References

- Davis, G.A. (1973). Psychology of problem solving: Theory and practice. New York: Basic Books.
- DeYoung, L. (1901). Dynamics of nursing (4th edition). St. Louis: Mosby.
- deTornyay, R. (1968). Measuring problem solving by means of the simulated clinical nursing problem test. Journal of Nursing Education, 7, 3-6.
- Farrand, L., Holzemer, W., & Schleutermann, J. (1982). A study of construct validity: Simulations as a measure of nurse practitioners problem solving skills. Nursing Research, 31(1), 37-42.
- Frederickson, K., & Mayer, G. (1977). Problem solving skills: What effect does education have? American Journal of Nursing, 77, 1167-1169.
- Goldstein, J. (1980). Comparison of graduating associate degree and baccalaureate degree nursing students' characteristics. Nursing Research, 29, 46-49.
- Gray, J., Murray, B., Roy, J., & Sawyer, J. (1977). Do graduates of technical and professional nursing programs differ in practice? Nursing Outlook, 23, 368-373.
- Guyton, J. (1984, January). The effects of teaching clinical problem solving to nursing students. (Abstract) In Society for Research in Nursing Education, Conference on research in nursing education: programs and abstracts; (p. 72). San Francisco: Author.

- Holzemer, W., Schleutermann, J., Farrand, L., & Miller, A. (1981). Simulations as a measure of nurse practitioners' problem-solving skills. Nursing Research, 30 (3), 139-144.
- Hogstel, M. (1977). Associate degree and baccalaureate graduates: Do they function differently? American Journal of Nursing, 77, 1598-1600.
- Howell, F. (1978). Employers' evaluations of new graduates. Nursing Outlook, 26, (7), 448-451.
- Mayer, R. (1983). Thinking, problem solving, cognition. San Francisco: W. F. Freeman.
- McClure, M. (1978). Entry into professional practice: The new york proposal. In Chaska, N. (Ed.) The nursing profession: Views through the mist, pp. 93-99. St. Louis: McGraw Hill.
- Murray, L., and Morris, D. (1982). Professional autonomy among senior nursing students in diploma, associate degree, and baccalaureate nursing programs. Nursing Research, 31, (5), 311-313.
- Reid, B. (1981). A comparison of the psychometric properties and relative predictive abilities of two patient care simulations for associate and baccalaureate nursing students. (Doctoral dissertation, Memphis State University, 1981). Dissertation Abstracts International, 42, 2782B.
- Rogers, M. (1985). The need for licensure to practice professional nursing. Journal of Profesional Nursing, 1, (6), 384.

- Simon, H. (1978). Information-processing theory of human problem solving. In W. D. Estes (Ed.), Handbook of cognitive process, Vol. 5: Human information processing (pp. 271-295). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Sparks, R. (1979). Problem solving ability of graduates from associate and baccalaureate degree nursing programs. (Doctoral dissertation, University of Minnesota, 1979). Dissertation Abstracts International, 40, 678B.
- Verhonick, P., Nichols, G., Glor, B., & McCarthy, R. (1968). I came, I saw, I responded. Nursing Research, 17 (1), 38-44.
- Waters, V., Chater, S., Vivier, M., Urrea, J., & Wilson, H. (1972). Technical and professional nursing: An exploratory study. Nursing Research, 21, 124-131.